

Response And Amendment

U.S. Application No. 10/723,428

Docket No. MR/02-003

Page 11 of 32

II. AMENDMENTS TO THE CLAIMS

Please amend claims 99, 117, 139, 140, 162, 163, 171 and 172 as directed below. Claims 1-98 were previously cancelled. Claims 100-116, 118-138, 141-161, 164-170 and 173 have not been revised but are reprinted below for the Examiner's convenience. The claims have thus been amended in the manner required by 37 C.F.R. §1.121.

99. (Currently Amended) A head coil for use with a magnetic resonance (MR) system capable of acquiring images of a region of interest using parallel imaging techniques; the head coil comprising:

(a) a first ring at an inferior end of the head coil, said first ring being electrically conductive and having a first diameter through which the region of interest is provided access to the head coil;

(b) a second ring at a superior end of the head coil, said second ring being electrically conductive and having a second diameter smaller than said first diameter of said first ring; and

(c) a plurality of rods electrically interconnecting said first and said second rings to form a birdcage-like structure therewith, each of said rods having a linear portion and a tapered portion with said linear portion being connected to said first ring and said tapered portion being connected to said second ring, said tapered portions of said rods collectively providing the head coil with a substantially homogeneous pattern of magnetic flux density in at least one of three orthogonal imaging planes of the head coil while performing at least one of maintaining and improving a signal-to-noise ratio of the head coil;

wherein said rods and said first and said second rings are configured to produce about the birdcage-like structure a plurality of partially-overlapped primary resonant substructures, with each of

Response And Amendment

U.S. Application No. 10/723,428

Docket No. MR/02-003

Page 12 of 32

said primary resonant substructures including two of said rods and a corresponding section of each of said first and said second rings interconnecting ~~[[them, which are]]~~ them such that each of said primary resonant substructures partially overlaps each of its neighboring primary resonant substructures and is capable of ~~[[being used by the MR system for simultaneous reception of]]~~ receiving magnetic resonance signals from a portion of the region of interest within its field of view.

100. (Previously Presented) The head coil of claim 99 wherein said plurality of partially-overlapped primary resonant substructures are deployed generally symmetrically about the birdcage-like structure.

101. (Previously Presented) The head coil of claim 99 wherein said plurality of partially-overlapped primary resonant substructures is three in number, with each being generally deployed 120 degrees apart.

102. (Previously Presented) The head coil of claim 101 wherein selected ones of said rods are spaced at irregular distances from adjacent ones of said rods.

103. (Previously Presented) The head coil of claim 99 wherein said plurality of partially-overlapped primary resonant substructures is four in number, with each being generally deployed 90 degrees apart.

Response And Amendment

U.S. Application No. 10/723,428

Docket No. MR/02-003

Page 13 of 32

104. (Previously Presented) The head coil of claim 103 wherein selected ones of said rods are spaced at irregular distances from adjacent ones of said rods.

105. (Previously Presented) The head coil of claim 99 wherein said plurality of partially-overlapped primary resonant substructures is six in number, with each being generally deployed 60 degrees apart.

106. (Previously Presented) The head coil of claim 105 wherein selected ones of said rods are spaced at irregular distances from adjacent ones of said rods.

107. (Previously Presented) The head coil of claim 99 wherein selected ones of said rods are spaced at irregular distances from adjacent ones of said rods.

108. (Previously Presented) The head coil of claim 99 wherein:

(a) said plurality of rods is eight in number and selected ones of said rods are spaced at irregular distances from adjacent ones of said rods; and

(b) said plurality of partially-overlapped primary resonant substructures is four in number, with each being generally deployed 90 degrees apart.

Response And Amendment

U.S. Application No. 10/723,428

Docket No. MR/02-003

Page 14 of 32

109. (Previously Presented) The head coil of claim 99 wherein the head coil is a receive-only coil.

110. (Previously Presented) The head coil of claim 99 wherein:

(a) each of said primary resonant substructures includes an active decoupling network in said corresponding section of said second ring thereof; and

(b) each of said rods includes a passive decoupling network therein.

111. (Previously Presented) The head coil of claim 99 wherein each of said rods and said first and said second rings contain therein a plurality of reactive electrical components.

112. (Previously Presented) The head coil of claim 99 wherein each of said primary resonant substructures includes a port connector in said corresponding section of said second ring thereof for connection to a channel of the MR system.

113. (Previously Presented) The head coil of claim 99 wherein the head coil is configured as one of a low pass coil, a high pass coil and a band pass coil.

114. (Previously Presented) The head coil of claim 99 wherein said first and said second rings are circular.

Response And Amendment

U.S. Application No. 10/723,428

Docket No. MR/02-003

Page 15 of 32

115. (Previously Presented) The head coil of claim 99 wherein at least one of said first and said second rings are elliptical.

116. (Previously Presented) The head coil of claim 99 wherein said first ring and said second ring are each larger in diameter than a center of the head coil.

117. (Currently Amended) A coil for use with a magnetic resonance (MR) system; the coil comprising:

(a) a first ring at one end of the coil, said first ring being electrically conductive and having a first diameter;

(b) a second ring at an other end of the coil, said second ring being electrically conductive and having a second diameter; and

(c) a plurality of rods electrically interconnecting said first and said second rings to form a birdcage-like structure therewith;

wherein said rods and said first and said second rings are configured to produce a plurality of partially-overlapped primary resonant substructures about the birdcage-like structure, with each of said primary resonant substructures including two of said rods and a corresponding section of each of said first and said second rings interconnecting them such that each of said primary resonant substructures partially overlaps each of its neighboring primary resonant substructures and is capable of receiving magnetic resonance signals from tissue within its field of view.

Response And Amendment

U.S. Application No. 10/723,428

Docket No. MR/02-003

Page 16 of 32

118. (Previously Presented) The coil of claim 117 wherein said second diameter of said second ring is smaller than said first diameter of said first ring.

119. (Previously Presented) The coil of claim 118 wherein each of said rods has a linear portion and a tapered portion with said linear portion being connected to said first ring and said tapered portion being connected to said second ring.

120. (Previously Presented) The coil of claim 119 wherein said tapered portion of each of said rods comprises at least one angled linear segmented section.

121. (Previously Presented) The coil of claim 117 wherein said first and said second diameters of said first and said second rings, respectively, are equal.

122. (Previously Presented) The coil of claim 117 wherein said first and said second rings are circular.

123. (Previously Presented) The coil of claim 117 wherein at least one of said first and said second rings are elliptical.

Response And Amendment

U.S. Application No. 10/723,428

Docket No. MR/02-003

Page 17 of 32

124. (Previously Presented) The coil of claim 117 wherein said plurality of partially-overlapped primary resonant substructures are deployed generally symmetrically about the birdcage-like structure.

125. (Previously Presented) The coil of claim 117 wherein said plurality of partially-overlapped primary resonant substructures is three in number, with each being generally deployed 120 degrees apart.

126. (Previously Presented) The coil of claim 125 wherein selected ones of said rods are spaced at irregular distances from adjacent ones of said rods.

127. (Previously Presented) The coil of claim 117 wherein said plurality of partially-overlapped primary resonant substructures is four in number, with each being generally deployed 90 degrees apart.

128. (Previously Presented) The coil of claim 127 wherein selected ones of said rods are spaced at irregular distances from adjacent ones of said rods.

129. (Previously Presented) The coil of claim 117 wherein said plurality of partially-overlapped primary resonant substructures is six in number, with each being generally deployed 60 degrees apart.

Response And Amendment

U.S. Application No. 10/723,428

Docket No. MR/02-003

Page 18 of 32

130. (Previously Presented) The coil of claim 129 wherein selected ones of said rods are spaced at irregular distances from adjacent ones of said rods.

131. (Previously Presented) The coil of claim 117 wherein selected ones of said rods are spaced at irregular distances from adjacent ones of said rods.

132. (Previously Presented) The coil of claim 117 wherein:

(a) said plurality of rods is eight in number and selected ones of said rods are spaced at irregular distances from adjacent ones of said rods; and

(b) said plurality of partially-overlapped primary resonant substructures is four in number, with each being generally deployed 90 degrees apart.

133. (Previously Presented) The coil of claim 117 wherein the coil is a receive-only coil.

134. (Previously Presented) The coil of claim 117 wherein:

(a) each of said primary resonant substructures includes an active decoupling network in said corresponding section of said second ring thereof; and

(b) each of said rods includes a passive decoupling network therein.

Response And Amendment

U.S. Application No. 10/723,428

Docket No. MR/02-003

Page 19 of 32

135. (Previously Presented) The coil of claim 117 wherein each of said primary resonant substructures includes a port connector in said corresponding section of said second ring thereof for connection to one channel of the MR system.

136. (Previously Presented) The coil of claim 117 wherein the coil is configured as one of a low pass coil, a high pass coil and a band pass coil.

137. (Previously Presented) The coil of claim 117 wherein said first ring and said second ring are each larger in diameter than a center of the coil.

138. (Previously Presented) The coil of claim 117 wherein said first ring and said second ring are each smaller in diameter than a center of the coil.

139. (Currently Amended) The coil of claim 117 wherein each of said primary resonant substructures is used to ~~[[receive]]~~ convey the magnetic resonance signals received from the tissue within its field of view ~~[[for conveyance]]~~ to one channel of the MR system during a receive cycle thereof.

140. (Currently Amended) A coil for use with a magnetic resonance (MR) system; the coil comprising:

Response And Amendment

U.S. Application No. 10/723,428

Docket No. MR/02-003

Page 20 of 32

(a) a pair of electrically conductive rings, each of said rings being disposed approximately at an opposite end of the coil from the other; and

(b) a plurality of rods electrically interconnecting said rings to form a birdcage-like structure therewith;

wherein said rods and said rings are configured to produce a plurality of partially-overlapped primary resonant substructures about the birdcage-like structure, with each of said primary resonant substructures including two of said rods and a corresponding section of each of said rings interconnecting them such that each of said primary resonant substructures partially overlaps each of its neighboring primary resonant substructures and is capable of receiving magnetic resonance signals from tissue within its field of view.

141. (Previously Presented) The coil of claim 140 wherein a first of said rings has a first diameter and a second of said rings has a second diameter, with said second diameter being smaller than said first diameter.

142. (Previously Presented) The coil of claim 141 wherein each of said rods has a linear portion and a tapered portion with said linear portion being connected to said first ring and said tapered portion being connected to said second ring.

143. (Previously Presented) The coil of claim 142 wherein said tapered portion of each of said rods comprises at least one angled linear segmented section.

Response And Amendment

U.S. Application No. 10/723,428

Docket No. MR/02-003

Page 21 of 32

144. (Previously Presented) The coil of claim 140 wherein a first of said rings has a first diameter and a second of said rings has a second diameter, with said second diameter being equal to said first diameter.

145. (Previously Presented) The coil of claim 140 wherein both of said pair of rings are circular.

146. (Previously Presented) The coil of claim 140 wherein at least one of said pair of rings is elliptical.

147. (Previously Presented) The coil of claim 140 wherein said plurality of partially-overlapped primary resonant substructures are deployed generally symmetrically about the birdcage-like structure.

148. (Previously Presented) The coil of claim 140 wherein said plurality of partially-overlapped primary resonant substructures is three in number, with each being generally deployed 120 degrees apart.

149. (Previously Presented) The coil of claim 148 wherein selected ones of said rods are spaced at irregular distances from adjacent ones of said rods.

Response And Amendment

U.S. Application No. 10/723,428

Docket No. MR/02-003

Page 22 of 32

150. (Previously Presented) The coil of claim 140 wherein said plurality of partially-overlapped primary resonant substructures is four in number, with each being generally deployed 90 degrees apart.

151. (Previously Presented) The coil of claim 150 wherein selected ones of said rods are spaced at irregular distances from adjacent ones of said rods.

152. (Previously Presented) The coil of claim 140 wherein said plurality of partially-overlapped primary resonant substructures is six in number, with each being generally deployed 60 degrees apart.

153. (Previously Presented) The coil of claim 152 wherein selected ones of said rods are spaced at irregular distances from adjacent ones of said rods.

154. (Previously Presented) The coil of claim 140 wherein selected ones of said rods are spaced at irregular distances from adjacent ones of said rods.

155. (Previously Presented) The coil of claim 140 wherein:

(a) said plurality of rods is eight in number and selected ones of said rods are spaced at irregular distances from adjacent ones of said rods; and

Response And Amendment

U.S. Application No. 10/723,428

Docket No. MR/02-003

Page 23 of 32

(b) said plurality of partially-overlapped primary resonant substructures is four in number, with each being generally deployed 90 degrees apart.

156. (Previously Presented) The coil of claim 140 wherein the coil is a receive-only coil.

157. (Previously Presented) The coil of claim 140 wherein:

(a) each of said primary resonant substructures includes an active decoupling network in said corresponding section of a second of said pair of rings thereof; and

(b) each of said rods includes a passive decoupling network therein.

158. (Previously Presented) The coil of claim 140 wherein each of said primary resonant substructures includes a port connector in said corresponding section of a second of said pair of rings thereof for connection to one channel of the MR system.

159. (Previously Presented) The coil of claim 140 wherein the coil is configured as one of a low pass coil, a high pass coil and a band pass coil.

160. (Previously Presented) The coil of claim 140 wherein said rings are each larger in diameter than a center of the coil.

Response And Amendment

U.S. Application No. 10/723,428

Docket No. MR/02-003

Page 24 of 32

161. (Previously Presented) The coil of claim 140 wherein said rings are each smaller in diameter than a center of the coil.

162. (Currently Amended) The coil of claim 140 wherein each of said primary resonant substructures is used to ~~[[receive]]~~ convey the magnetic resonance signals received from the tissue within its field of view ~~[[for conveyance]]~~ to one channel of the MR system during a receive cycle thereof.

163. (Currently Amended) A coil for use with a magnetic resonance (MR) system; the coil comprising:

(a) a first end member approximate one end of the coil, said first end member being electrically conductive;

(b) a second end member approximate an other end of the coil, said second end member being electrically conductive; and

(c) a plurality of rods electrically interconnecting said first and said second end members;

wherein said rods and said first and said second end members are configured to yield a plurality of partially-overlapped primary resonant substructures, with each of said primary resonant substructures including two of said rods and a corresponding section of each of said first and said second end members interconnecting them such that each of said primary resonant substructures partially overlaps at least one of its neighboring primary resonant substructures and is capable of receiving magnetic resonance signals from tissue within its field of view.

Response And Amendment

U.S. Application No. 10/723,428

Docket No. MR/02-003

Page 25 of 32

164. (Previously Presented) The coil of claim 163 wherein:

(a) said first and said second end members are rings; and

(b) said rods and said first and said second end members are interconnected to form a birdcage-like structure with said plurality of partially-overlapped primary resonant substructures deployed thereabout.

165. (Previously Presented) The coil of claim 163 wherein said rods and said first and said second end members are interconnected to form an open-sided birdcage-like structure with said plurality of partially-overlapped primary resonant substructures deployed thereabout.

166. (Previously Presented) The coil of claim 163 wherein said rods and said first and said second end members are interconnected to form a surface coil-like structure with said plurality of partially-overlapped primary resonant substructures deployed therealong.

167. (Previously Presented) The coil of claim 163 wherein the coil is a receive-only coil.

168. (Previously Presented) The coil of claim 163 wherein:

(a) each of said primary resonant substructures includes an active decoupling network in said corresponding section of one of said end members thereof; and

(b) each of said rods includes a passive decoupling network therein.

Response And Amendment

U.S. Application No. 10/723,428

Docket No. MR/02-003

Page 26 of 32

169. (Previously Presented) The coil of claim 163 wherein each of said primary resonant substructures includes a port connector in said corresponding section of one of said end members thereof for connection to one channel of the MR system.

170. (Previously Presented) The coil of claim 163 wherein the coil is configured as one of a low pass coil, a high pass coil and a band pass coil.

171. (Currently Amended) The coil of claim 163 wherein each of said primary resonant substructures is used to ~~[[receive]]~~ convey the magnetic resonance signals received from the tissue within its field of view ~~[[for conveyance]]~~ to one channel of the MR system during a receive cycle thereof.

172. (Currently Amended) A neurovascular array for use with a magnetic resonance (MR) system; the neurovascular array comprising:

(a) a head coil including:

(I) a first ring approximate one end of the head coil, said first ring being electrically conductive and having a first diameter,

(II) a second ring approximate an other end of the head coil, said second ring being electrically conductive and having a second diameter, and

Response And Amendment

U.S. Application No. 10/723,428

Docket No. MR/02-003

Page 27 of 32

(III) a plurality of rods electrically interconnecting said first and said second rings to form a birdcage-like structure therewith,

wherein said rods and said first and said second rings are configured to produce a plurality of partially-overlapped primary resonant substructures about the birdcage-like structure, with each of said primary resonant substructures constituting a coil element having two of said rods and a corresponding section of each of said first and said second rings interconnecting them such that each of said coil elements partially overlaps each of its neighboring coil elements and is capable of receiving magnetic resonance signals from tissue within its field of view;

- (b) an anterior neck coil including at least one coil element; and
- (c) a posterior cervical spine coil including at least one coil element.

173. (Previously Presented) The neurovascular array of claim 172 wherein at least one of said coil elements of said anterior neck coil and said posterior cervical spine coil partially overlaps said head coil at an inferior end thereof.